Lake Huron Strategic Fisheries Management Plan

Draft

Ontario

Ministry of Natural Resources

Hon. Vincent G. Kerrio
Minister

Mary Mogford
Deputy Minister

May 5, 1986

NORTH CHANNEL FISHERIES MANAGEMENT

Statement of Intent

Fisheries management on the North Channel of Lake Huron has generated a considerable amount of interest among local sportsmen, lodge owners, commercial fishermen and municipalities. The North Channel is recognized as a world class boating area, and it is generally acknowledged that an excellent angling fishery could also be developed.

Historically, lake trout was the top predator species in the North Channel; however, the population was eliminated by sea lamprey and over-fishing. With better controls over fishing pressure and the present sea lamprey control program, it is the long-term intent of the Ontario Ministry of Natural Resources to re-establish either lake trout or lake trout backcross as the top open-water predator in the North Channel.

In keeping with this intent, the lake trout backcross is being stocked east of Darch Island. It is our present plan to rehabilitate this area with a native species (lake trout backcross) and to increase our stocking to 500,000 yearlings from the present 300,000. Pacific salmon stocking would not be allowed in this area.

There is presently insufficient space at our provincial hatcheries to begin rehabilitation efforts to the west of Darch Island. This situation may continue well into the future. In the interim the Ontario Ministry of Natural Resources will cooperate with private groups wishing to raise and stock chinook salmon west of Darch Island. It must be recognized that an increase in the chinook salmon population in the North Channel will impact on the existing forage base. This will adversely affect the commercial fishing industry and, therefore, an agreement concerning commercial catches of chinook salmon should be worked out.

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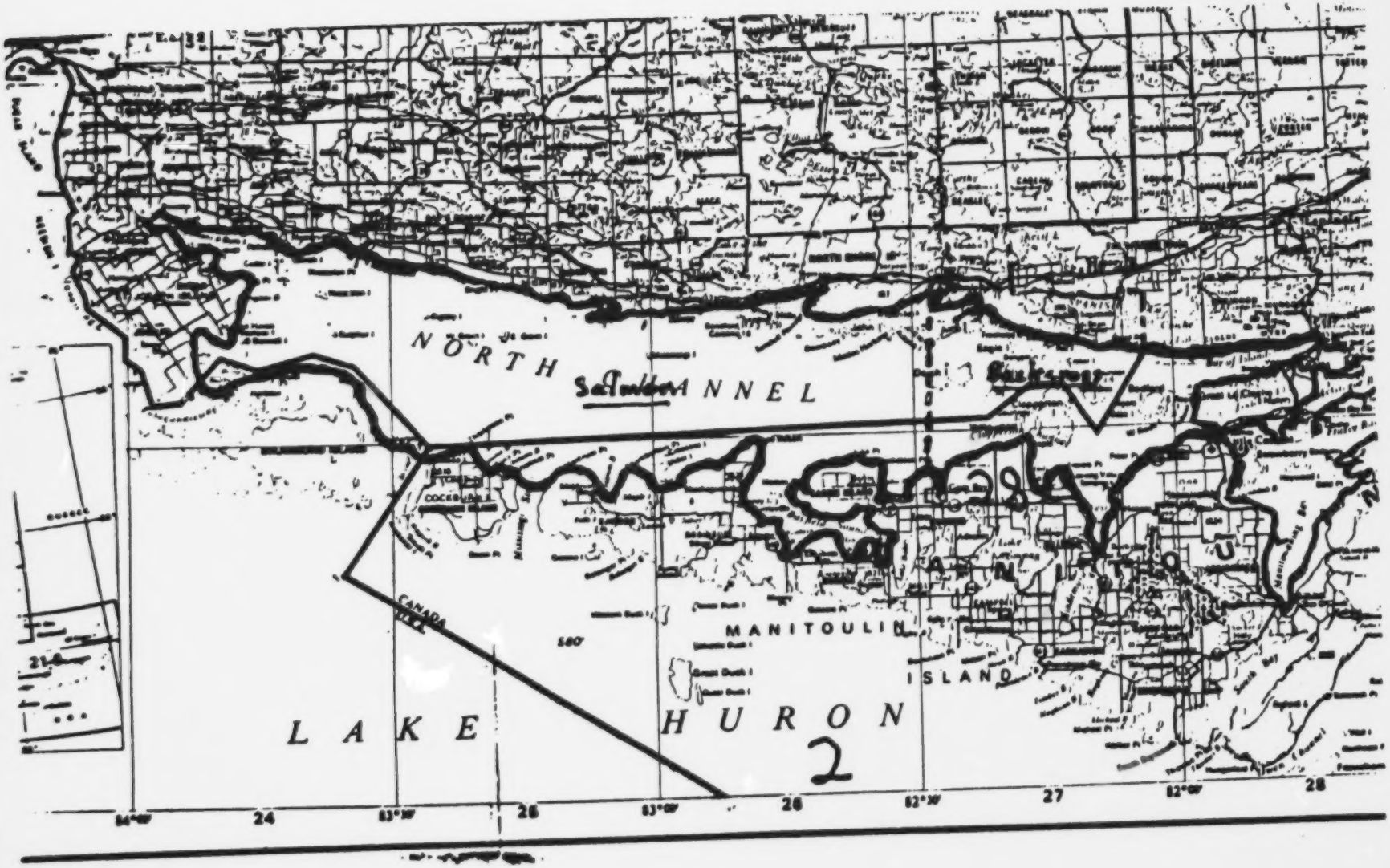
The Ministry of Natural Resources will not be utilizing hatchery space in provincial hatcheries to raise chinook salmon for stocking in the North Channel since all available space must be used for rehabilitation stocking. At present, the Ministry will not actively manage for natural reproduction of chinook salmon.

Along with the management of open-water top predators the Ministry of Natural Resources will manage for other native sport species where they occur or where they have historically occurred. Yellow pickerel, bass, pike, musky, and panfish occur in various bays and around islands in the North Channel. The Ministry's intent in these areas will be outlined in the appropriate District Fisheries Management Plan. Rainbow trout also occur in the North Channel and many inflowing streams and rivers act as spawning and nursery sites. The Ministry will actively manage this species through regulations, habitat protection and habitat improvement programs.

The Ministry has adopted a neutral stance concerning pink salmon. The species will not be actively managed. Coho salmon stocking will be discouraged due to negative interactions between this species and rainbow trout in the stream environment.

This option for management of the North Channel will be included in all pertinent draft District Fisheries Management Plans (Sault Ste. Marie, Blind River, Espanola, Sudbury). Although the draft Lake Huron Fisheries Management Plan does not specify many of these details, we feel the general strategies of that plan do allow for these management approaches. Final acceptance of this option in either the district plans and/or the lake plan will depend in measure on public consultative feedback.

Drafted by: Mike Powell, Regional Fisheries Biologist, and
John Chevalier, Regional Biologist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Lake Huron Strategic Fisheries Management Plan

Draft

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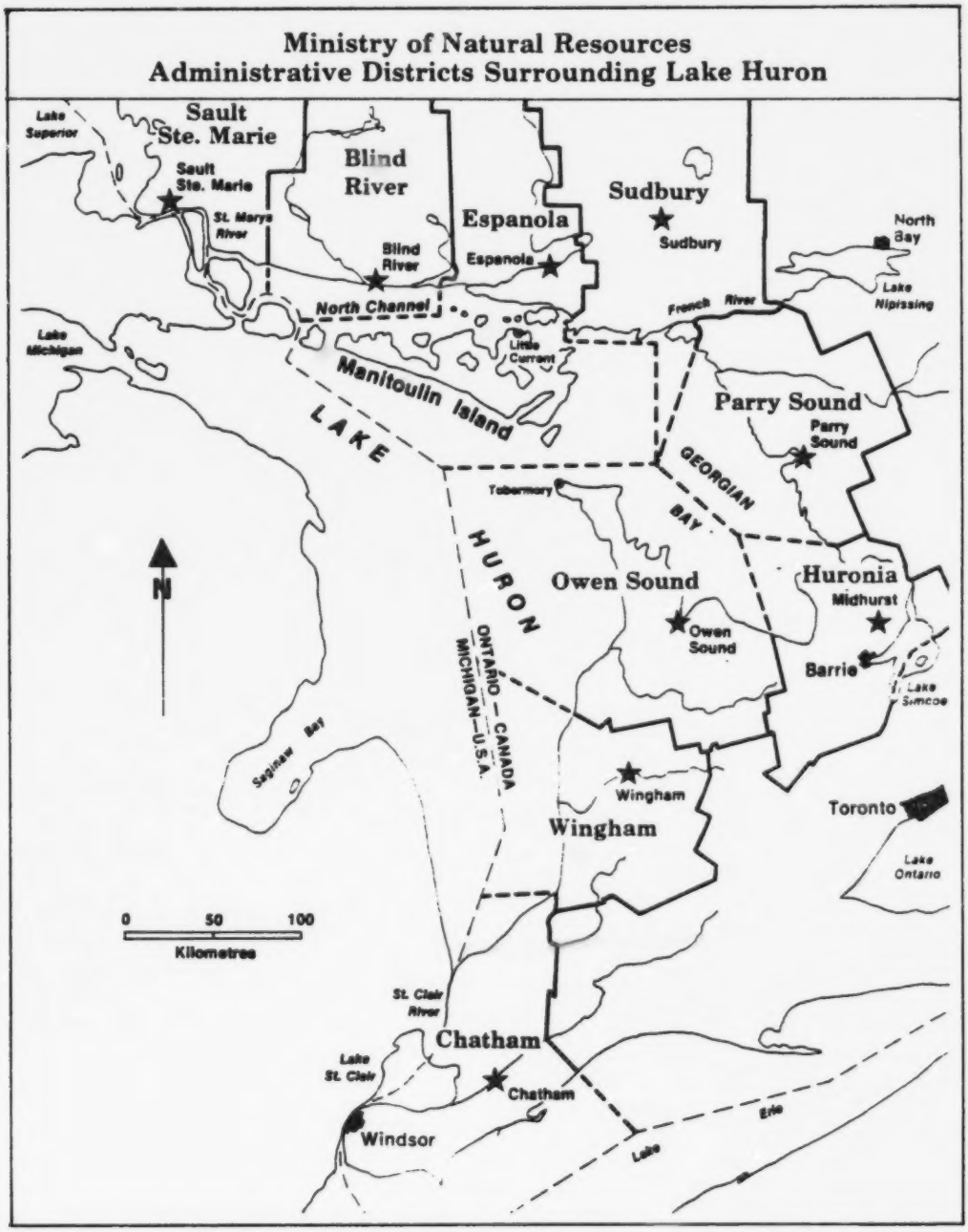
Ministry of Natural Resources
Administrative Districts Surrounding Lake Huron
Lake Superior
Sault Ste. Marie
Sault Ste. Marie
St. Marys River
Blind River
Blind River
Espanola
Espanola
Sudbury
Sudbury
North Bay
Lake Nipissing
French River
North Channel
Little Current
Lake Michigan
Manitoulin Island
LAKE
HURON
Parry Sound
Parry Sound
GEORGIAN BAY
Tobermory
Owen Sound
Owen Sound
Huronia
Midhurst
Barrie
Lake Simcoe
ONTARIO — CANADA
MICHIGAN — U.S.A.
Saginaw Bay
Wingham
Wingham
Toronto
Lake Ontario
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Kilometres
St. Clair River
Chatham
Chatham
Lake St. Clair
Windsor
Lake Erie

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PREFACE

This document presents a lake-wide strategy and acts as a guideline for more detailed operational District Fisheries Management Plans. It identifies objectives and targets, and management direction for their achievement. The direction given in this strategy is the result of a consideration of all feasible options. The preferred options presented reflect the best judgement of the committee to meet the proposed targets within the capabilities of the resource.

EXECUTIVE SUMMARY

1. INTRODUCTION

The policy framework and goal for fisheries management in Ontario as stated by the task force on Strategic Planning for Ontario Fisheries (SPOF) is:

> *TO PROVIDE FROM THE FISHERIES RESOURCE OF ONTARIO OPPORTUNITIES FOR OUTDOOR RECREATION AND RESOURCE DEVELOPMENT FOR THE CONTINUOUS SOCIAL AND ECONOMIC BENEFIT OF THE PEOPLE OF ONTARIO AND TO ENCOURAGE THE ADMINISTRATION, PROTECTION AND CONSERVATION OF PUBLIC LANDS AND WATERS TO ENSURE PRESERVATION OF FISHERIES RESOURCES.*

This is the goal for Lake Huron.

Problems which interfere with the realization of this goal on Lake Huron include overfishing, difficulty of rehabilitating some stocks, localized environmental degradation, failure to achieve harmonious use, and the need for more effective management/administration.

This Lake Huron Strategic Fisheries Management Plan emanates from SPOF and provides a comprehensive and strategic perspective to guide managers and supplement the direction in Strategic and District Land Use Guidelines.

The plan is founded on the premise that native species provide the most stable, self-sustaining fish community which is essential for optimal realization of the goal.

2. BACKGROUND

Lake Huron is still oligotrophic and can support all species native to the lake. However, some inshore environmental concerns are agricultural runoff, localized habitat alteration, water flow regulation in tributary streams and St. Mary's River, and airborne contamination.

Important changes to the fish community include the near extinction of the lake trout, reduced stocks of walleye, and the partial replacement of native lake herring and chub with the introduced exotics, alewife and smelt. These changes, brought about by overfishing, sea lamprey predation, and competition from exotics, have considerably reduced the combined sport and commercial harvest from historical levels.

3. OBJECTIVES AND MANAGEMENT DIRECTION

Objectives and management direction have been developed to ensure achievement of the lake goal.

3.1 FISH COMMUNITY OBJECTIVE

RESTORE BALANCED FISH COMMUNITIES CAPABLE OF SELF-MAINTENANCE WHICH PROVIDE HIGHLY VALUED FISHING OPPORTUNITIES AND FISH PRODUCTS.

A balanced community means a species assemblage that offers full niche utilization and population structures that promote good reproduction and growth while having the capacity to support a harvest consistent with the productivity of the habitat.

Potential annual yield based on the historical record is 5.2 million kg. Identified targets estimate a harvest of 4.3 million kg by the year 2000.

The introduction of Pacific salmon on a large scale will only be implemented if they are needed for the realization of an important management objective and will not seriously impact native species. The fish community objective will be achieved by:

1. CONSERVATION

Conserve fish communities and stocks for resource maintenance, genetic diversity and self-sustaining harvests.

2. REHABILITATION

Rehabilitate depleted species and stocks to levels where sustainable harvests can be maintained by natural reproduction and where necessary, substitute replacement species for those that have become extinct or cannot be rehabilitated.

The offshore fish community is to be re-established with the lake trout backcross and lake trout. Certain walleye and whitefish populations and the lake herring are in need of rehabilitation. A more diverse sea lamprey control program is needed.

Measures for assessing the success of rehabilitation are identified.

3. RESEARCH AND ASSESSMENT

Identify and collect the information required to understand, conserve, manage and rehabilitate fish communities and stocks while also permitting optimal harvesting.

3.2 BENEFIT OBJECTIVE

PROVIDE OPPORTUNITIES FOR RECREATION AND ECONOMIC BENEFITS CONSISTENT WITH THE MAINTENANCE OF HEALTHY FISH COMMUNITIES INCLUDING:

- *MEETING THE DEMAND FOR SPORT FISHING WITHIN THE LIMITS OF A WISELY MANAGED AND REHABILITATED RESOURCE; AND*

- *MAINTAINING A VIABLE COMMERCIAL FISHING INDUSTRY.*

A total of 3 million angling occasions should be provided by the year 2000 with approximately 1 million kg of fish available for the sport harvest and 3.3 million kg for the commercial fishery. Provision of optimum benefits is complicated by the necessity of ensuring adequate fish stocks to maintain and rehabilitate fish communities while meeting social and economic needs. Actions to achieve these targets include:

1. ALLOCATION OF HARVEST

Apportion allowable harvest according to the Provincial allocation policy for fisheries resources.
Priorities according to SPOF Working Group No. 5, are:

1st - Maintenance/rehabilitation needs
2nd - Legal obligations, such as Indian treaties
3rd - Resident sport fishermen
4th - Allocate to other users (commercial and outfitter/charter industries) on the basis of optimum benefit to Ontario.

2. OPTIMIZATION OF RETURN

Optimize the return to the province from the sport and commercial fisheries.

3. UTILIZATION OF NON-TARGET SPECIES

Encourage recreational and commercial use of underutilized species and stocks.

4. ENCOURAGEMENT OF NON-CONSUMPTIVE USE

Promote non-consumptive use of the lake's fishery resources.

3.3 ENVIRONMENTAL OBJECTIVE

PROVIDE AN ENVIRONMENT IN THE LAKE AND ITS TRIBUTARIES WHICH CAN SUPPORT SELF-MAINTAINING POPULATIONS OF DESIRED AND WHOLESOME FISH SPECIES

Direction to achieve this objective will concentrate on:

1. CONTROL OF EUTROPHICATION

Work with the Ministry of the Environment, Ministry of Agriculture and Food, Conservation Authorities, municipalities and the Ministry of Municipal Affairs to ensure that the offshore and most inshore waters of Lake Huron remain in an oligotrophic state with total phosphorus concentrations being kept at or below their present levels of 5 ug/l in offshore waters.

2. MINIMIZING CONTAMINANTS

Work with the Ministry of the Environment, Department of Fisheries and Oceans, the International Joint Commission and other agencies to eliminate or minimize the input of toxic and hazardous substances into the waters of Lake Huron to reduce contaminants in fish flesh to levels acceptable for fish health and human consumption.

3. PROTECTING HABITAT

Protect and rehabilitate fish habitat including stream habitat which is or could be used by lake dwelling fish.

4. WORKING TO CONTROL ACIDIC DEPOSITION

Participate with and support other agency efforts to understand and limit the effects of acid precipitation.

3.4 GENERAL STRATEGIES

A number of management actions are common to each objective and must be employed if there is to be an effective implementation of the lake management strategy. These general strategies are:

1. IMPROVE INTERAGENCY COORDINATION

Ensure that interagency and intergovernmental cooperation, coordination and involvement occur to achieve lake objectives and strategies.

2. BUILD PUBLIC SUPPORT

Build support for the Lake Huron fisheries management effort through programs of information exchange, education and public consultation.

3. IMPROVE MANAGEMENT EFFECTIVENESS

Improve the effectiveness of the assessment, enforcement and allocation systems so they work in harmony to maintain and rehabilitate fish stocks and fish communities while still permitting an optimum harvest.

4. IMPLEMENTATION

Implementation of the strategy will be achieved primarily through the implementation of specific Fisheries Management Plans in the nine Lake Huron districts. All district plans and management actions will be consistent with the Lake Huron Strategy.

The major management thrusts during the next 5 years should be:

1. Continue present efforts at all levels related to:

   - culture and stocking of the lake trout backcross;
   - modernization of the commercial fishery; and
   - re-establishment of depleted walleye populations

2. Initiate new programs with respect to:

   - assessment of paired plants of lake trout and lake trout backcross; and
   - establishment of refuges and development of experimental programs with refuges.

3. Districts, with guidance from the Lake Huron Fisheries Management Committee, should prepare a coordinated set of fisheries management/operational plans which examine in detail local problems and set out specific tactics for their resolution.

   Overall policy direction and guidance will continue to be provided by the Lake Huron Committee, which has been structured to recognize the responsibility of districts for program delivery. The basin subcommittee structure and individual district managers will continue to make daily decisions necessary for the management of the lake.

1. INTRODUCTION

The policy framework for fisheries management in Ontario has been provided by the task force on Strategic Planning for Ontario Fisheries (SPOF) which established the provincial fisheries management goal and gave direction for management efforts. The goal (First SPOF Report, 1976) is:

> *To provide from the fisheries resources of Ontario opportunities for outdoor recreation and resource development for the continuous social and economic benefit of the people of Ontario and to encourage the administration, protection and conservation of public lands and waters to ensure preservation of fisheries resources.*

Among the problems which interfere with the realization of this goal are overfishing, a deteriorating environment, conflicts among user groups, a failure to recognize the social and economic sequences of management efforts and resource use, and inadequate information. The task force and the associated working groups were given the resolution of these problems as their primary focus. The policy and management direction provided by SPOF has been refined through the Ministry's Strategic and District Land Use Planning programs. These identify the Ministry's objectives, targets and strategies for management in each of the Ministry's districts and provide direction for the preparation of more detailed district fisheries management and operating plans. The Lake Huron Strategy is designed to fit into this process at a strategic level.

As the various parts of Lake Huron cannot be managed independently, a comprehensive lake management strategy is needed to give additional guidance to management in each district. The purpose of this report, the Lake Huron Strategic Fisheries Management Plan, is to provide that guidance.

Though districts are responsible for management of the fishery resource, co-ordination of the management effort on a lake-wide basis is the responsibility of the Lake Huron Fisheries Management Committee (LHFMC) and its two basin subcommittees. These bodies function in a consultative and advisory role and were given responsibility for the development of this strategic plan.

Preparation of the plan has been guided by the following management elements set out in the SPOF Report No. 4:

- use available knowledge to the full to manage fisheries and conflicting uses of the environment;
- develop the knowledge base essential for effective management of Ontario fisheries; and
- create an aware public and develop mechanisms for public involvement in decision-making.

In addition, the plan is further guided by the following assumptions:

- native fish are well adapted to the habitat and, therefore, can be managed to provide stable communities preferable to non-native (exotic) species; and
- a stable, balanced and self-sustaining fish community is essential to the achievement of optimal long-term benefits.

The Lake Huron Strategic Fisheries Management Plan is designed to serve the interests of all Ontarians. Consistent with the provincial fisheries management goal, the strategy gives first priority to preserving the fishery resources of the lake for the continuous and optimal benefit of all citizens. Special attention is given to those users directly affected by the status of the resource-native food fisheries, recreational and commercial fishermen, tourist operators and other businesses.

The time horizon for the strategy is the year 2000. The strategy will be reviewed periodically.

This report begins (Section 2) with a brief review of the characteristics of Lake Huron, its importance and the management problems which have been encountered or are anticipated. Section 3 establishes the goal and objectives for fisheries management in the lake, and examines each objective and sets out long-term targets and management direction. Section 4 provides a brief statement on implementation.

2. BACKGROUND

2.1 Perspective

Lake Huron is the fifth largest freshwater lake in the world with a surface area of 59,570 sq. km, a maximum depth of 229 m and a mean depth of 59 m. The State of Michigan lies to the west of the lake and the Province of Ontario to the east and north. Lake Huron is divided into three relatively discrete basins - Lake Huron proper, Georgian Bay and the North Channel (68, 25 and 7 percent, respectively, of the surface area). Approximately 65 percent or 39,135 sq. km of Lake Huron is under Canadian jurisdiction.

Active settlement of the watershed began before 1850. In the latter part of the 19th century, shipping, commercial fishing and the rafting of logs were the principal uses of the lake. Of these, shipping and commercial fishing have remained important, although the commercial harvest of fish has declined in weight by approximately 2.5 million kg or more from historic levels. Recreational boating, swimming, cottaging, tourism and angling (more than two million recreation days of angling per year in Canadian waters) have become important uses of the lake in this century. The lake receives some industrial, municipal and agricultural pollutants, and waste heat from thermal electric generating stations.

Further details including additional resource information are in the report "Background Document, Lake Huron Fisheries Management Plan." (Anonymous, 1984 (ii)).

2.2 Summary of Background Document

The offshore waters of Lake Huron have changed little in the last 200 years except for the appearance of low concentrations of certain contaminants such as PCBs. These waters are still highly oligotrophic and capable of supporting all native fish species.

Some difficulties have been encountered in inshore areas. Concerns include: accumulation of agricultural runoff in inshore waters; the destruction of aquatic plants in cottage areas; the potential impact of Eurasian milfoil in southern Georgian Bay; loss of spawning and nursery habitat in tributaries; flow regulation in rivers such as the St. Marys and Moon; and acid precipitation.

Except for the impacts on tributary streams, the changes in the fish community appear to be of greater importance than the modified environment. Native stocks of lake trout have all but been eliminated. Walleye and whitefish are significantly reduced in some areas. Consequently, the current commercial and sport harvest is less than half historic levels. Re-establishment of an offshore top predator will be required to regain former of levels of harvest in keeping with the carrying capacity of the lake.

In the absence of a top predator, the non-native alewife and rainbow smelt have replaced the commercially valuable lake herring and chub as the principal offshore forage species. Four of the six chub species have disappeared from the lake. Georgian Bay appears to be the only place where the shortnose chub (Coregonus reighardi) still occurs. White perch have now extended their range to include lower Lake Huron.

Following their invasion in the 1930s, predation by sea lamprey was a major factor in the decline of high valued species. Though temporarily under control in most areas this predator still constrains production where control has been difficult, such as areas near the St. Mary's River.

2.3 Legislative Authority

Ontario administers the Fisheries Act (Canada) through an agreement reached with the Federal government in 1922. The sport fishery is governed under this Act by the Ontario Fishery Regulations with respect to seasons, size limits, fishing gear and establishment of sanctuaries. The commercial fishery is managed under these regulations and the Game and Fish Act (Ontario). This is accomplished through licencing and other regulations which may specify catch, areas, seasons, and fishing gear.

The Fisheries Act also provides for the protection of fisheries habitat. The Ministry administers a number of other acts such as the Public Lands Act, the Beds of Navigable Waters Act and the Lakes and Rivers Improvement Act which also may provide habitat protection.

Protection of fisheries habitat is further influenced by the programs and actions of other agencies. The Ministry of the Environment has the primary responsibility for water quality. The Ministry of Municipal Affairs and various municipalities regulate land based activities (via official plans and municipal by-laws). The Ministry of Agriculture and Food has significant influence on agricultural land use. Conservation Authorities undertake activities and administer programs with respect to erosion control and flood plain management. Thus, the Ministry of Natural Resources must work with these agencies to protect or rehabilitate fish habitat.

3. MANAGEMENT DIRECTION

The provincial fisheries management goal is also the goal for fisheries management on Lake Huron:

> *TO PROVIDE FROM THE FISHERIES RESOURCES OF LAKE HURON OPPORTUNITIES FOR OUTDOOR RECREATION AND RESOURCE DEVELOPMENT FOR THE CONTINUOUS SOCIAL AND ECONOMIC BENEFIT OF THE PEOPLE OF ONTARIO AND TO ENCOURAGE THE ADMINISTRATION, PROTECTION AND CONSERVATION OF PUBLIC LANDS AND WATERS TO ENSURE PRESERVATION OF FISHERIES RESOURCES.*

This goal embodies the overall objectives of the Ministry related to resource production, outdoor recreation and tourism and to the protection and conservation of public lands and waters. It recognizes the interrelationship of optimal benefits, suitable environment, and the managed harvest of a healthy fish community. In further recognition of these interrelationships, specific objectives are defined for each of these areas.

3.1 Fish Community Objective

> *RESTORE BALANCED FISH COMMUNITIES CAPABLE OF SELF-MAINTENANCE WHICH PROVIDE HIGHLY VALUED FISHING OPPORTUNITIES AND FISH PRODUCTS.*

Balance means the capacity to support a harvest consistent with the productivity of the habitat, a species assemblage that offers full niche utilization, and population structures that promote good reproduction and growth. To achieve this balance, self-sustaining indigenous fish communities are normally preferred because historically they provided relatively stable, high yields of valuable species (e.g. chub and lake herring compared to the unstable and low-valued exotic rainbow smelt and alewife). Naturally reproducing communities also adapt to more fully exploit available niches. Maintaining populations by stocking is costly, often is not successful, can dilute desirable genetic qualities in the remaining native fish and can introduce diseases. Further, the consequences of introducing exotics are often difficult to predict.

3.1.1 Discussion

The annual potential yield for the Canadian waters of Lake Huron derived from the morphoedaphic index (Ryder 1965) is 7.5 million kg. The historic yield during the period 1911-1940 was 5.2 million kg. (SPOF Working Group Report No. 4 1979). This long term average harvest is likely a more realistic estimate of potential yield. Assuming fully rehabilitated fish communities for the future the annual sustainable fish yield for Lake Huron should be about 5.2-5.5 million kg. By way of comparison, commercial harvest in the Canadian waters of Lake Huron in 1984 was 2.8 million kg. Current production is constrained by the small biomass of top predators (i.e. salmonids) in offshore waters.

Targets identified by Strategic and District Land Use Planning guidelines anticipate a harvest for all species of 4.3 million kg by the year 2000. Therefore, it is apparent that the rehabilitation process will not be complete until well beyond the year 2000. A forecast of potential annual yield for a rehabilitated Lake Huron is shown in Table 1.

The greatest problem in achieving the fish community objective for the year 2000 and beyond is to increase the production of top predators in offshore waters. Two additional problems exist in offshore waters. One is the questionable suitability and stability of the present forage base which is composed chiefly of the low value exotic alewife and rainbow smelt. The other is the extinction or scarcity of many commercially valuable coregonids (whitefish family) which were once an important component of the forage base.

In inshore waters, the situation generally requires maintaining and increasing the abundance of preferred species. Lake sturgeon numbers are low and walleye populations appear to be depressed in parts of Georgian Bay and the North Channel. Black crappie are expanding and there is concern about their impact on other preferred fish stocks.

Table 1. Potential annual yield (kg) for rehabilitated fish communities of the Canadian waters of Lake Huron.

Species Group	Huron proper	Georgian Bay	North Channel	Total
Salmonids	1,025,000	650,000	225,000	1,900,000
Coregonids	890,000	335,000	110,000	1,335,000
Percids	347,000	125,000	103,000	575,000
Other species	480,000	805,000	405,000	1,690,000
Total	2,742,000	1,915,000	843,000	5,500,000

Provincial policy with respect to the introduction of Pacific salmon in Lake Huron allows for the planting of chinook salmon, but not coho. The potential for such introductions to become self-sustaining and their full impact on native species in the Great Lakes is not yet fully understood. (Anonymous, 1984 (ii)).

It is proposed that non-native exotic species could be considered for introduction when the two following conditions are met:

- the exotic is needed to fulfill an important management objective;
- the exotic will not seriously impact on native species.

3.1.2 Strategies

Strategy 1

Conservation: Conserve fish communities and stocks for resource maintenance, genetic diversity and self-sustaining harvests.

Problems in implementing this strategy include:

- the difficulty and high cost of identifying fish stocks;

- the extraordinary effort required for preserving and rebuilding some depressed species and stocks; and

- the significant cost which may be incurred to provide perceived intangible benefits (e.g. preservation of endangered species).

This strategy may be implemented by the following methods:

(i) Utilize existing information from research and assessment to identify fish communities and stocks and to allocate resources with an appropriate margin of safety for their perpetuation.

(ii) Protect important fish communities and stocks.

(iii) Interact with agencies whose mandates influence fish communities.

(iv) Develop more effective means to identify and control exploitation (see SPOF Working Group Reports No. 15 and 16 and the 1982 report on Modernization of the Commercial Fishery).

(v) Preserve genetic material from remnant stocks (i.e. Iroquois Bay, Parry Sound).

(vi) Identify and protect fish species whose survival is endangered or threatened (e.g. the shortnose cisco).

(vii) Prevent new introduction of unwanted exotics.

(viii) Maintain an adequate population of predators to prevent unwanted exotics which are already established in the lake from becoming more abundant.

Strategy 2

Rehabilitation: Rehabilitate depleted species and stocks to levels where sustainable harvests can be maintained by natural reproduction and where necessary, substitute replacement species for those that have become extinct or cannot be rehabilitated.

Historically, the lake trout was the most abundant offshore predator and was highly desired by both the sport and commercial fisheries. Remnant populations of lake trout still exist in Iroquois Bay and in Parry Sound and attempts will continue to maintain and restore these stocks. The Ministry of Natural Resources, in accord with the Great Lakes Fishery Commission, has stocked mainly lake trout backcross rather than the lake trout in Lake Huron. This hybrid, which is considered to be a native fish, is approximately 80 percent lake trout and 20 percent brook trout. It is faster growing and earlier maturing than the lake trout but longer-lived than the splake (a brook trout - lake trout hybrid cross), enabling it to reproduce before becoming fully vulnerable to lamprey predation. In the meantime, U.S. agencies are actively stocking lake trout in the American waters of Lake Huron to provide a diversity of salmonid top predators.

Given the current level of sea lamprey control, lake trout could be planted on a large scale, although experiences in the other Great Lakes has shown that rehabilitation is a slow process (as long as 20 years). Any such plantings should be done in an experimental management context and in conjunction with planting of lake trout backcross so that the relative performance of each with respect to survival, growth and reproduction can be properly assessed. Further, such planting experiments should be conducted in refuge areas where fishing mortality is not a confounding factor. This would show which, if any, offers a significant advantage over the other in Lake Huron.

Both backcross and lake trout are preferable to chinook and coho as these exotics may be limited by a lack of suitable stream nursery areas and be unable to fully utilize the offshore niche. There is also a concern that coho could displace resident salmonids from streams. Lake trout and older backcross trout both

consume a greater diversity of food which implies they might be less affected by natural fluctuations in the abundance of alewife and rainbow smelt.

Stocks of walleye are also depressed in certain locations due to over-exploitation, water level fluctuations in spawning tributaries and the possible influence of acid rain. Specific efforts are directed towards rehabilitation of this species.

Stocks undergo natural fluctuations and it is often difficult to separate these occurrences from those induced by man. Therefore, managers need to be cautious when identifying stocks requiring rehabilitation.

The rehabilitation objective is addressed by the following:

(i) Control harvests of fish stocks designated for rehabilitation.

(ii) Where stocking is necessary to rebuild degraded communities, use the best genetic material available (i.e. use existing gene pools, if possible).

(iii) Rehabilitate the offshore predator population by culturing and stocking lake trout backcross and possibly lake trout by:

- developing a short- and long-term stocking plan for the entire lake;

- restricting sport and commercial harvests to ensure that total annual mortality rate of backcross and lake trout does not exceed 50 percent; and

- evaluating the success of the rehabilitation effort at least every 5 years.

(Rehabilitation will be considered successful when the actual yield of naturally reproduced fish approaches potential yield).

(iv) Maintain and rehabilitate, if possible, remnant lake trout stocks of eastern Georgian Bay by culturing and stocking lake trout of Iroquois Bay and Parry Sound origin.

(v) Rehabilitate depressed stocks of walleye by:

- improving habitat;
- restricting harvest to ensure total annual mortality does not exceed 40 percent; and
- stocking when appropriate.

(Rehabilitation will be considered successful when the actual yield of naturally reproduced fish approaches potential yield).

(vi) Develop the science to rebuild lake herring stocks.

(vii) Co-ordinate fish stocking and consideration of exotics with the GLFC, the State of Michigan and other agencies and user groups.

(viii) Continue to support the sea lamprey control program and the development of an integrated lamprey management initiative.

Strategy 3

Research and Assessment: Determine and collect the information required to understand, conserve, manage and rehabilitate fish communities and stocks while also permitting optimal harvesting.

The amount of information required for conservation, rehabilitation and maintenance depends, in part, on how intensively stocks are harvested, whether or not allowable catch can be adjusted within a fishing season and effectiveness of enforcement. Activities which lead to the achievement of this objective are:

(i) Ensure research and assessment efforts reflect the intensity of resource use and the margin of safety built into allowable harvest.

(ii) Increase our ability to identify and monitor the condition of stocks.

(iii) Monitor backcross trout for natural reproduction and determine reliable estimates of natural and fishing mortality.

(iv) Evaluate the importance of the emerald shiner to the production of preferred species and fish community stability.

(v) Determine the ability of top predators to reduce alewife and smelt populations and develop optimal predator/prey ratio estimates.

(vi) Evaluate the suitability of rainbow smelt and alewife as a major diet item for top predators (physiological health).

(vii) Determine the extent and effect of predation by rainbow smelt on salmonids and coregonids.

(viii) Evaluate the changing status of black crappie and associated community effects, especially in respect to impacts on walleye and muskellunge.

(ix) Continue to monitor lamprey predation.

(x) Evaluate interspecific relationships between salmonids (including Pacific salmon) in the lake and the streams.

(xi) Monitor lake herring stocks and determine what factors inhibit rehabilitation.

3.2 Benefit Objective

PROVIDE OPPORTUNITIES FOR RECREATION AND ECONOMIC BENEFITS CONSISTENT WITH THE MAINTENANCE OF HEALTHY FISH COMMUNITIES INCLUDING:

- *MEETING THE DEMAND FOR SPORT FISHING WITHIN THE LIMITS OF A WISELY MANAGED AND REHABILITATED RESOURCE; AND*

- *MAINTAINING A VIABLE COMMERCIAL FISHING INDUSTRY.*

3.2.1 Discussion

Total sport fishing pressure on Lake Huron was estimated to be 2.4 million occasions in 1980 (Angler Survey, 1980). In order for the lake to maintain its present contribution to provincial sport fishery targets, a total of approximately 3 million fishing occasions should be provided by the year 2000. Approximately 1 million kg of fish are required to meet this target, if a quality standard of .32 kg harvested per occasion is to be maintained.

The current average angling harvest per occasion is .32 kg.

The targets for commercial fishing for the year 2000 provide for an increase in harvest from 2.8 million kg to 3.3 million kg.

The provision of optimum benefits requires special attention to the following:

- ensuring adequate fish stocks to maintain and rehabilitate fish communities while continuing to meet social and economic needs;
- determining what the proper mix of benefits is among competing user groups;
- providing desired benefits through encouraging utilization of less desired and underutilized species; and
- providing for non-consumptive uses.

Strategies to address each of these are identified below.

3.2.2 Strategies

Strategy 1

Allocation of Harvest: Apportion allowable harvests according to the provincial allocation policy for fisheries resources.

SPOF Working Group Report No. 5 advocated the following hierarchy:

1. Maintenance/rehabilitation needs

2. Legal obligations, such as Indian treaties

3. Resident sport fishermen

4. Other users (commercial and outfitter/charter boat industries) on the basis of optimum benefit to the residents of Ontario.

The benefit targets identified in the District Guidelines proposed an allowable harvest which would permit existing fish communities to be maintained or enhanced. Requirements for status Indians with treaty rights are included in the calculated targets.

The allocation of the allowable harvest of the fisheries resource among user groups will be based on an objective and careful examination of all relevant biological, social and economic factors to ensure that the optimum benefit accrues to the residents of Ontario. It is the responsibility of both anglers and commercial fishermen to participate in co-operative management and to adhere to catch limits, quotas and regulations to protect the fish stocks and help guarantee their perpetuation in the future. There may be a need for the provision of short-term, artificially maintained fisheries to achieve the benefit objective.

The strategy will be achieved by:

(i) Determining the rehabilitation and maintenance needs for various stocks (see also the fish community objective).

(ii) Determining the annual allowable yield.

(iii) Confirming user requirements and legal obligations.

(iv) Determining methods for assessing the harvest.

(v) Ensuring adherence to regulations.

Strategy 2

Optimization of Return: Optimize the return to the province from the sport and commercial fisheries.

Optimization means obtaining the greatest possible net benefits. It requires the evaluation of economic, social and biological values. It is extremely difficult to quantify and compare many of these values.

There are conflicts between sport and commercial fishermen for limited supplies of fish - in particular, walleye and lake trout backcross in Georgian Bay. The Ministry has taken steps to resolve these conflicts by purchasing some commercial fisheries where intractable problems occur.

The Lake Huron commercial fishery has not escaped the problems common to such fisheries elsewhere, such as over-capitalization, fishing effort expanding beyond the point of profitability and regulations that promote inefficiency - factors which inevitably result in pressures to over-exploit the fisheries resource.

Many changes are needed in the present management system if the Lake Huron fishery is to produce to its potential. Mechanisms to promote this strategy include:

(i) Allocate fish fairly among the resident sport fishery, the non-resident tourist fishery and the commercial fishery through a careful evaluation of benefits.

(ii) Promote changes in the commercial fishing industry and its regulation which improve economic efficiency yet protect the resource base.

Strategy 3

Utilization of
Non-Target Species: Encourage recreational and commercial use of underutilized species and stocks.

This strategy could provide additional income to commercial fishermen and the tourist industry, reduce stress on heavily utilized species and stocks and create a feasible means of reducing the abundance of underutilized species. The following are suggested courses of action:

(i) Identify underutilized species and stocks (e.g. pink salmon).

(ii) Publicize and promote these identified angling opportunities.

(iii) Promote the commercial harvesting of underutilized species where appropriate.

(iv) Provide assistance to the commercial fishing industry in gaining access to processing and marketing expertise.

(v) Facilitate access to underutilized species by encouraging innovation in harvesting, e.g. regulation of time and place of harvest, changes in gear.

(vi) Promote an angling attitude which encourages use of all fish species.

Strategy 4

Encouragement of
Non-Consumptive Use: Promote non-consumptive use of the lake's fishery resources.

Non-consumptive use includes fish viewing and catch-and-release angling. They also include the knowledge that healthy fish communities are being maintained.

Means to achieve this strategy are:

(i) Promote the study and understanding of the non-consumptive aspects of fishing and the fishery resource.

(ii) Continue to provide and expand fish viewing opportunities at fishways, spawning areas, hatcheries, provincial parks and other areas.

(iii) Consider innovative management techniques such as establishing catch-release areas.

(iv) Promote the view that a healthy fish community reflects a healthy environment.

3.3 Environmental Objective

PROVIDE AN ENVIRONMENT IN THE LAKE AND ITS TRIBUTARIES WHICH CAN SUPPORT SELF-MAINTAINING POPULATIONS OF DESIRED AND WHOLESOME FISH SPECIES.

3.3.1 Discussion

Problems and issues relating to the environment were discussed in the background paper. The more important of these were summarized in the introduction. Particular concerns relate to eutrophication, existence of contaminants, habitat deterioration, and potential impacts of acidification. Specific strategies related to each of these are presented below.

3.3.2 Strategies

Strategy 1

Control of Eutrophication: Work with the Ministry of the Environment, Ministry of Agriculture and Food, Conservation Authorities, Municipalities and the Ministry of Municipal Affairs to ensure that the offshore, and most inshore waters of Lake Huron remain in an oligotrophic state with total phosphorus concentrations being kept at or below their present levels of 5 ug/1 in offshore waters.

Oligotrophic conditions are necessary for the maintenance of healthy salmonid and coregonid stocks. Phosphorus inputs are of concern because they can lead to eutrophication. Few signs of eutrophication are evident when total phosphorus concentration is less than 10 ug/1 (IJC 1979). However, recent evidence suggests that even this phosphorus concentration could cause undesirable effects (Jackson and Hamdy 1982). Thus, it is suggested that phosphorus be kept close to its present level of 5 ug/1 in offshore waters. Achievement of this strategy depends on adequate pollution control measures being put into effect. Achievement of this strategy includes:

(i) Work with the Ministry of Environment to control phosphorus input from all point sources.

(ii) Work actively with Agriculture and Food, Municipal Affairs, Conservation Authorities and Environment to reduce diffuse sources of phosphorus including agricultural activities.

(iii) Encourage assessment of environmental impacts for all new projects which could produce significant sources of phosphorus.

Strategy 2

Minimizing Contaminants: Work with the Ministry of the Environment, Department of Fisheries and Oceans, the International Joint Commission and other agencies to eliminate or minimize the input of toxic and hazardous substances into the waters of Lake Huron to reduce contaminants in fish flesh to levels acceptable for fish health and human consumption.

Though contaminants appear in only trace amounts in the water of the lake, they can accumulate in the tissues of fish and other animals to concentrations that may impair reproductive capability and make fish unsafe for human consumption. Today, the only contaminants which appear to be of concern in Lake Huron fish are polychlorinated biphenyls, whose levels are declining, and mercury, which mostly comes from natural sources (A. F. Johnson, MOE, p.c.; MOE 1983). Federal guidelines suggest restricted or no consumption of fish when the concentration of PCB's reaches 2.0 ppm and/or or mercury reaches 0.5 ppm in fish flesh. Allowable levels for fish health are not known.

Though the contaminant problem might seem to be under control, caution is required because new chemical compounds may enter the aquatic food chain and present health risks in the future. In addition, there may be synergistic effects of several forms working in combination. This strategy is best addressed by the following:

(i) Continue to support MOE and DFO in monitoring of contaminants in fish. Recommend monitoring for new contaminants and for synergistic effects.

(ii) Work with MOE and IJC to rectify contaminant problems. Support the creation of safe waste disposal sites, the development of low risk pesticides and herbicides and obtain strict controls on or prohibit the use of dangerous chemicals.

(iii) Continue to disseminate information on contaminant levels in fish supplied by MOE, DFO and Ministry of Health.

(iv) In conjunction with MOE and the Fish Inspection Branch of DFO, examine the rationale for the contaminant monitoring program and devise a schedule that co-ordinates efforts to reflect needs and priorities.

Strategy 3

Protecting Habitat: Protect and rehabilitate fish habitat, including stream habitat which is or could be used by lake dwelling fish.

The destruction of inshore spawning and nursery areas does not appear to be a serious problem lake-wide though local areas need special attention, such as Matchedash (Severn) Sound and the east shore of the main basin south of the Bruce Peninsula where there are few protected bays.

Streams that flow through intensively cultivated areas are often no longer suitable as spawning and nursery habitat for salmonids and walleye. This is a particular problem in southern Lake Huron counties. Barrier dams on tributaries can block the migration of lake dwelling fish to spawning and nursery areas. These dams can also result in the release of warm water. Regulation of river flow is a serious problem in both the St. Marys and Moon Rivers and of a lesser concern in several other rivers. To protect and rehabilitate habitat, the following actions are suggested:

(i) Identify and map important fish habitat with particular emphasis on spawning and nursery habitat.

(ii) Determine the measures required to preserve this habitat with special attention to streams and wetlands.

(iii) Determine habitat rehabilitation requirements and priority rate them with special attention to streams and wetlands.

(iv) Increase public awareness of habitat problems to assist in obtaining compliance with good habitat management.

(v) Review municipal plans and liaise with other agencies to ensure habitat protection.

(vi) Encourage community sponsored projects to rehabilitate degraded fish habitat.

(vii) Upgrade staff expertise in fish habitat management.

(viii) Use the proposed IJC dredging and disposal guidelines for dredging/disposal operations.

(ix) Minimize the negative impacts of large volume water intakes and warmwater discharges from thermal generating facilities.

(x) Strengthen existing review procedures for aquatic vegetation control - establish mechanisms to control mechanical harvesting.

(xi) Liaise with and advise other agencies on the hazards to fish of herbicides and pesticides.

(xii) Liaise with other agencies and the private sector to minimize the negative impacts of fluctuating water levels on fish habitat with particular emphasis on the flow problems in the Moon and St. Marys Rivers.

(xiii) Remove barriers to fish movement (e.g. remove dams, install fishways).

(xiv) Work with other agencies to find means of mitigating the effects of construction activities.

(xv) Protect and rehabilitate streams in agricultural areas by working with landowners and sportsmen's groups, through MOE, OMAF, CA's and municipalities (official plans and zoning by-laws) and through co-operation with the Ontario Soil Conservation and Environmental Protection Assistance Program to:

- fence livestock from streams;
- minimize nutrient inputs from feedlot and poultry operations;
- minimize sediment and phosphorus losses from cultivated land;
- re-establish cover on stream banks; and
- encourage appropriate measures to stabilize stream flow.

Strategy 4

Work to Control Acid Deposition: Participate with and support other agency efforts to understand and limit the effects of acid precipitation.

(i) In conjunction with MOE and DFO, continue to monitor water chemistry of rivers flowing from the Canadian Shield.

(ii) Contribute to understanding the relationship between water chemistry and the health of fish stocks.

(iii) Mitigate, where appropriate and feasible, the effects of acid precipitation on stressed fish populations in the short-term.

(iv) Support long-term efforts to reduce emissions which cause acid precipitation at their source.

3.4 General Strategies

3.4.1 Discussion

A number of strategies are common to each of the objectives and must be employed if there is to be an effective implementation of the lake management strategy. These include making co-ordinated decisions, defining implementation authority and obtaining action from other agencies and levels of government. In addition, it is necessary to obtain public support for and input into the management effort.

3.4.2 Strategies

Strategy 1

Improve Interagency Coordination: Ensure that interagency and intergovernmental cooperation, coordination and involvement occur to achieve lake objectives and strategies

- by interacting with other agencies and governments in a proactive manner to meet the objectives outlined in this strategy.

Strategy 2

Build Public Support: Build support for the Lake Huron fisheries management effort through programs of information

exchange, education and public consultation. To be effective, the strategy needs to be understood by the public and needs to reflect their concerns. The consultation process should include fisheries users, other government agencies and the general public. The implementation of this strategy should:

(i) Ensure that field staff understand the rationale for the Lake Huron Fisheries Management Strategy so that they can communicate effectively with the public.

(ii) Examine the present user group consultation system and make adjustments where necessary.

Strategy 3

Improve Management Effectiveness: Improve the effectiveness of the assessment, enforcement and allocation systems so they work in harmony to maintain and rehabilitate fish stocks and fish communities while still permitting an optimum harvest.

In the past, there was often a failure to maintain stocks because of inadequate science, assessment and enforcement. Fiscal constraints dictate that the efficiency of these efforts be improved.

Harvest control has been particularly difficult due to the common property, open access nature of the resource. This has created a strong incentive for fishermen to fish without regard to sustainable yields. If enforcement is effective this tendency will be decreased. Effectiveness will be increased by:

(i) Reducing the incentive to over-exploit stocks by decreasing competition for the same fish stocks (e.g. individual quotas).

(ii) Adjusting the assessment, enforcement, and allocation systems so that they work in harmony within fiscal constraints to produce more effective fisheries management.

(iii) Developing mechanisms for fishermen to collect assessment data which meet standards set by the managers.

(iv) Modernizing data collection and analysis and finding ways of more effectively using district staff for data collection.

(v) Continuing to provide and improve training for assessment and enforcement staff.

(vi) Improving communication between the Ministry and their clients and involving sport and industry representatives in the allocation process.

4. IMPLEMENTATION

Implementation of the Lake Huron Fisheries Management Strategy will be achieved primarily through the 9 districts which border on Lake Huron. In this regard, the Lake Huron Strategy provides a framework within which districts can prepare more detailed management and operating plans. All district fisheries management plans, operating plans, work plans and management actions will be consistent with the Lake Huron Strategy.

The Lake Huron Strategy will be reviewed and updated periodically under the direction of the Lake Huron Fisheries Management Committee.

The major management thrust during the next 5 years should be:

1. Continue present efforts at all levels related to:
   - culture and stocking of the lake trout backcross;
   - modernization of the commercial fishery; and
   - re-establishment of depleted walleye populations.
2. Initiate new programs with respect to:
   - assessment of paired plants of lake trout and lake trout backcross; and
   - establishment of refuges and development of experimental management programs within refuges.
3. Districts, with guidance from the Lake Huron Fisheries Management Committee, should prepare a co-ordinated set of fisheries management/operational plans which examine in detail local problems and set out specific tactics for their resolution.

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